
5. Fractal

Program Name: Fractal.java Input File: fractal.dat

You recently learned about fractals in geometry class, and after deciding they are the coolest things ever, you decide to implement one. But having one pattern is boring, so you decide to define multiple rules of expansion for creating a fractal. You want to see what the fractal looks like after multiple iterations as defined by the expansion rules.

You will be given multiple fractals to create. Each fractal consists of the rules that define its expansion, as well as a list of tasks to be performed. Each task consists of a start state, and the number of expansions to run. Each rule defines what each string in the current state becomes in the next iteration of expansion.

To run an expansion of a given state, go through each string in the current state, and if it has a rule to expand it, replace it with the specified expansion in the next state; otherwise, just copy it to the next state.

Input

The first line of input contains F, the number of fractals that follow.

The first line of each fractal contains two integers R and T, the number of rules and tasks in the fractal.

The next R lines each contain one rule in the format $S \rightarrow S'$, where S is a string and S' is a space separated list of strings. Each S is unique, so there will not be multiple possible expansions for a single string.

The next T lines each contain a task. Each task consists of two lines. The first line contains two integers N and X, the number of strings in the start state, and X is the number of expansions to run. The next line contains N space-separated strings, the strings in the start state.

Output

For each fractal, output the fractal number, followed by the final results of each task, each on a separate line.

Constraints

1 \leq F \leq 5
1 \leq R, T \leq 10
1 \leq number of strings in S' \leq 3
1 \leq N \leq 4
1 \leq X \leq 5

Example Input File

```
2
1 3
X -> X X
1 1
X
1 2
X
2 1
X X
1 1
A -> A B
1 5
A
```

Example Output to Screen

```
Fractal #1:
X X
X X X X
X X X X
Fractal #2:
A B B B B B
```

Explanation of Example Output

For the first fractal, every X turns into two X's. Therefore, for the first task, we expand X once, getting X X. For the second task, we expand X twice, getting X X and then X X X X. For the third case, we expand X X once, getting X X X X.

For the second fractal, A turns into A B, and B stays a B since there is no rule for B.

We have to expand A five times. After once time it is A B, after two it is A B B, after three it is A B B B, after four it is A B B B B, and after 5 it is A B B B B B.